

# North-of-the-Delta Offstream Storage Investigation

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## Preliminary Results of Economics Analysis

September 28, 2011



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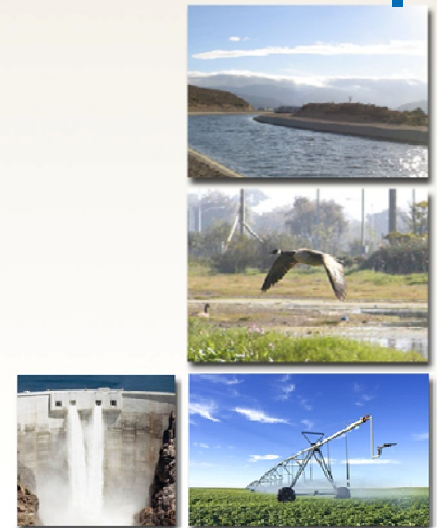
# Feasibility

Feasibility from a federal perspective includes:

- Technical
- Environmental
- Economic
- Financial (the likelihood of repayment)



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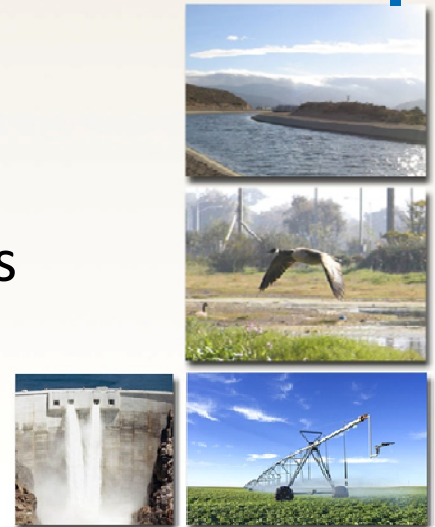
# Planning Objectives

- Primary Planning Objectives:
  - Water Supply and Reliability Benefits
  - Water Quality Improvement
  - Fisheries Restoration and Ecosystem Enhancement
  - Hydropower Integrated with Renewable Energy
- Secondary Planning Objectives:
  - Flood Damage Reduction
  - Recreation

Benefits and Costs annualized 50- and 100-years



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# Economic Evaluation Requirements

## Federal

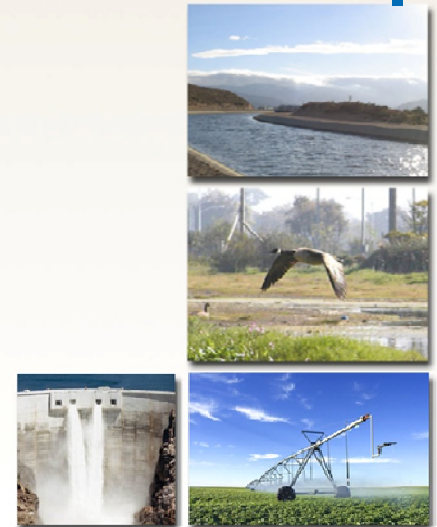
- Economic and Environmental Principles and Guidelines for Water and Land Related Resources Implementation Studies (P&G; WRC, 1983); changes pending, but uncertain
- Bureau of Reclamation's Economics Guidebook

## State

- Department of Water Resources' (DWR) Economics Guidebook
- 2009 Water Package Legislation, Public Benefits



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# Economic and Environmental Principles & Guidelines for Water and Related Land Resources Studies (P&G)

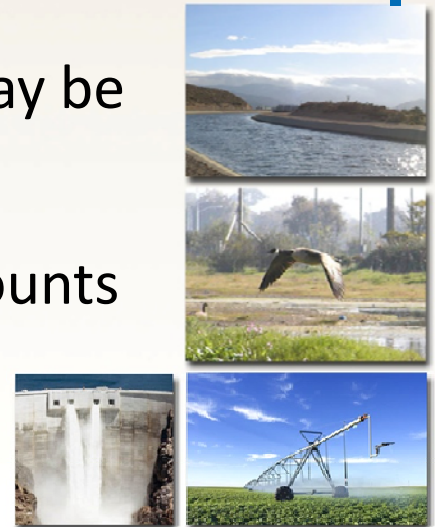
Federal feasibility studies must address P&G's and display potential effects (benefits, costs) in specified accounts:

- National Economic Development (NED); required
- Regional Economic Development (RED); optional
- Environmental Quality (EQ); required
- Other Social Effects (OSE); optional
- Other methods and non-monetary effects may be considered

NODOS Feasibility Analyses include all four accounts



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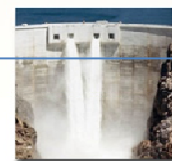


# National Economic Development (NED)

- Evaluate the direct net benefits to the nation
- Consider both market (e.g., water for agricultural use) and non-market benefits (recreation)
- Include implementation costs (e.g., opportunity cost of capital for construction)
- Include uncompensated adverse costs to third parties
- Determine net NED benefits



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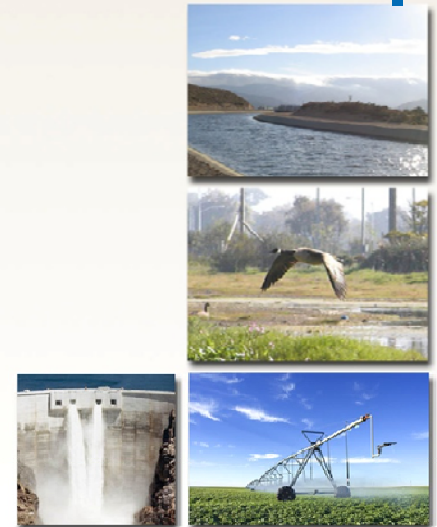


# Regional Economic Development (RED)

- Focus on output, employment, and income effects
- Examine regions of primary economic activity
- Consider the indirect effects of project-related spending
- RED and NED benefits are not additive



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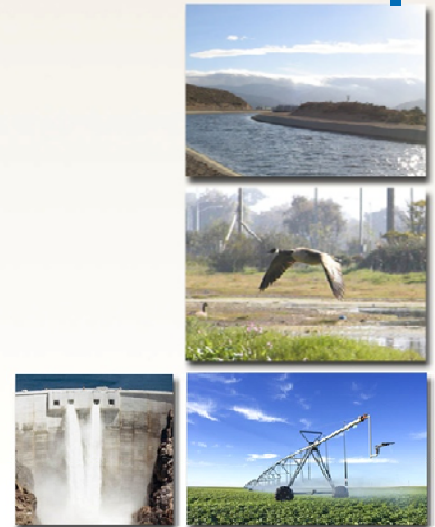


# Environmental Quality (EQ)

- Include beneficial and adverse effects on ecological, aesthetic, and cultural resources
- Exclude EQ effects monetized and included in NED
- Assess other EQ effects in physical or qualitative terms
- Describe in terms of frequency, duration, location, etc.



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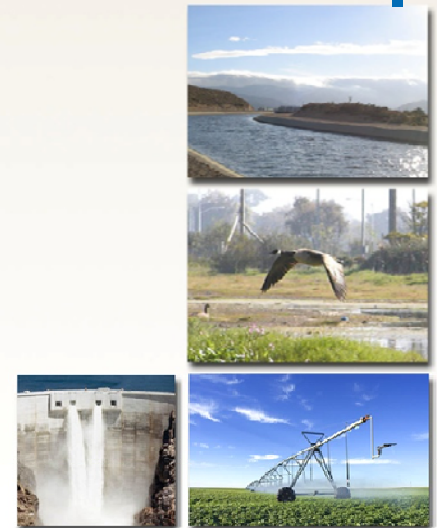


# Other Social Effects (OSE)

- Urban and community (employment, income distribution, fiscal, and quality of life)
- Life, health, and safety (flood risk, potential damage from structural failure, air quality impact)
- Displacement
- Long-term productivity
- Energy requirement and conservation



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# Potential Ag and M&I Water Supply Benefits

	Alternative A	Alternative B	Alternative C
<ul style="list-style-type: none"> <li>Storage</li> <li>Intake/Release at Delevan</li> </ul>	<ul style="list-style-type: none"> <li>1.2 MAF</li> <li>Both</li> </ul>	<ul style="list-style-type: none"> <li>1.8 MAF</li> <li>Release Only</li> </ul>	<ul style="list-style-type: none"> <li>1.8 MAF</li> <li>Both</li> </ul>
	<u>Avg : Dry Yr</u>	<u>Avg : Dry Yr</u>	<u>Avg : Dry Yr</u>
<ul style="list-style-type: none"> <li>Ag Supply (TAF)</li> <li>Ag Benefit (\$M)</li> </ul>	<ul style="list-style-type: none"> <li>62 : 106</li> <li>\$12 : \$23</li> </ul>	<ul style="list-style-type: none"> <li>35 : 71</li> <li>\$7 : \$16</li> </ul>	<ul style="list-style-type: none"> <li>57 : 100</li> <li>\$11 : \$23</li> </ul>
<ul style="list-style-type: none"> <li>M&amp;I Supply (TAF)</li> <li>M&amp;I Benefit (\$M)</li> </ul>	<ul style="list-style-type: none"> <li>93 : 207</li> <li>\$143 : \$323</li> </ul>	<ul style="list-style-type: none"> <li>97 : 191</li> <li>\$147 : \$278</li> </ul>	<ul style="list-style-type: none"> <li>102 : 229</li> <li>\$152 : \$366</li> </ul>



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# Potential Refuge Benefits

	Alt A	Alt B	Alt C
	<u>Avg : Dry Yr</u>	<u>Avg : Dry Yr</u>	<u>Avg : Dry Yr</u>
• Refuge Supply (TAF)	• 44 : 21	• 71 : 37	• 74 : 36
• Refuge Benefit (\$M)	• \$12 : \$8	• \$19 : \$14	• \$19 : \$14



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# Potential Water Quality Benefits

	Alt A	Alt B	Alt C
<ul style="list-style-type: none"> <li>EC Reductions at Clifton Court Forebay</li> </ul>	<u>Avg : Dry Yr</u> <ul style="list-style-type: none"> <li>7% : 11%</li> </ul>	<u>Avg : Dry Yr</u> <ul style="list-style-type: none"> <li>7% : 11%</li> </ul>	<u>Avg : Dry Yr</u> <ul style="list-style-type: none"> <li>9% : 14%</li> </ul>
<ul style="list-style-type: none"> <li>Water Quality Supply – AG Benefit (\$M)</li> </ul>	<ul style="list-style-type: none"> <li>\$1 : \$2</li> </ul>	<ul style="list-style-type: none"> <li>\$1 : \$3</li> </ul>	<ul style="list-style-type: none"> <li>\$2 : \$3</li> </ul>
<ul style="list-style-type: none"> <li>Water Quality Supply – M&amp;I Benefit (\$M)</li> </ul>	<ul style="list-style-type: none"> <li>\$17 : \$20</li> </ul>	<ul style="list-style-type: none"> <li>\$18 : \$22</li> </ul>	<ul style="list-style-type: none"> <li>\$22 : \$26</li> </ul>

## Agriculture

Irrigation water savings

## M&I

Reduced Water Treatment



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# Ecosystem Enhancement Benefits

Estimated Average Year Annual Ecosystem Enhancement  
Water Benefits Based on Coldwater Pool and Increased Flows

Alternative	Increase End of May Storage	Increased Flow	Total Benefits
A	\$25 M	\$17 M	\$42M
B	\$29 M	\$16 M	\$45M
C	\$29 M	\$16 M	\$45M



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# Power

Alternative	Pumping (\$M)	Releases (\$M)	Pump-back (\$M)	Total (\$M)
A	-\$14.1	\$12.5	\$3.1	\$1.5
B	-\$11.0	\$8.6	\$3.1	\$0.7
C	-\$15.9	\$14.4	\$3.0	\$1.5

Contribution from integration with renewable energy not estimated yet, but expected to increase benefits



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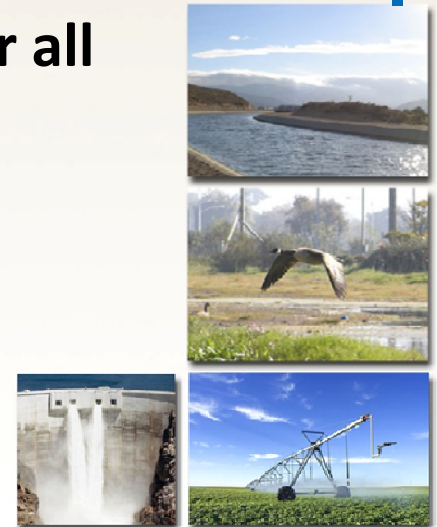
# Flood Damage Reduction

Reduced flooding risk for 4,600 acres in Stone Corral and Funks Creek watersheds and 4,025 acres in the Colusa Basin (100-year flood)

- Estimated average flood damage: \$1,000/acre
- Estimated annual flood damage reduction **for all alternatives**: \$86,250



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# Recreation Benefits

- 25% projected as net “new” recreation benefit  
75% relocated from other regional recreational facilities
- Projected 100,000 annual net new recreation user days.
- Adjustment for low surface water elevations

Alternative	Average Year	Dry/Critical Year
A	\$4 M	\$3 M
B	\$4 M	\$3 M
C	\$4 M	\$4 M



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# Preliminary Benefits Summary

Purpose	Alternative A	Alternative B	Alternative C
<b>Water Supply</b>	(\$M)	(\$M)	(\$M)
<i>Agricultural</i>	\$12	\$7	\$11
<i>Urban</i>	\$143	\$147	\$152
<i>Refuges</i>	\$12	\$19	\$19
<i>Conveyance Pumping</i>	-\$21	-\$21	-\$23
<b>Total</b>	\$146	\$152	\$159
<b>Water Quality</b>			
<i>Agricultural</i>	\$1	\$1	\$2
<i>Urban</i>	\$17	\$18	\$22
<b>Total</b>	\$18	\$19	\$24
<b>Ecosystem Enhancement</b>	\$42	\$45	\$45
<b>Hydropower (system)</b>	\$1.4	\$0.7	\$1.5
<b>Recreation</b>	\$4	\$4	\$4
<b>Flood Damage Reduction</b>	\$0.1	\$0.1	\$0.1
<b>Total</b>	\$212	\$220	\$234



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# Preliminary Benefit Cost Ratio

	Alt A (\$M)	Alt B (\$M)	Alt C (\$M)
Total Project Costs	\$3,579	\$3,384	\$3,887
Interest During Construction	\$1,028	\$972	\$1,117
<b><i>Annual Costs:</i></b>			
Interest/Amortization	\$186	\$176	\$202
Operations & Maintenance	\$18	\$14	\$20
<b>Total Annual Costs</b>	<b>\$204</b>	<b>\$190</b>	<b>\$222</b>
<b>Total Benefits</b>	<b>\$212</b>	<b>\$220</b>	<b>\$234</b>
<b>Net Benefits</b>	<b>\$8</b>	<b>\$30</b>	<b>\$12</b>
<b><i>Benefit Cost Ratio</i></b>	<b><i>1.0</i></b>	<b><i>1.2</i></b>	<b><i>1.1</i></b>



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# Preliminary Financial Analysis

- Tied to results of pending preliminary cost allocation
- Beneficiaries Pay (CALFED, Delta Plan, State & Federal Legislation)
- Must Assess Ability to Pay for Costs
- Primary Repayment Options for Agricultural and M&I Water Supply and Power (Federal costs)
- Results Presented in Draft and Final Feasibility Report
- Consider 2009 Water Package Requirements (State)



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## Next Steps – Define and Address Public Benefits Per State Requirements



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